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MUSHROOM CULTURE

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Widespread interest in the artificial culture of varieties of the common mushroom is evident from the numerous inquiries received by the Division of Botany every year, partly coming from persons eager to provide themselves with a fresh and self-raised supply for the table, and partly from persons whose interest has been aroused by reading alluring accounts of financial successes obtained from growing them for profit. The general experience is that failures far outnumber successes, and of all crops, mushrooms are the most difficult to grow as well as the most uncertain. Nevertheless, given suitable conditions and with the exercise of care and perseverance, satisfactory results are attainable. Mushrooms can be grown successfully on a commercial scale. Under such conditions it has become a specialty, the success of which depends not altogether upon extensive and systematic methods employed, but very largely upon the suitability of the quarters used.

The amateur, for whose guidance the following directions have been prepared, is advised to proceed slowly at the start and not to engage too extensively in a project likely to prove a disappointment unless the fundamentally important facilities are available.

Suitable Quarters and Control of Temperature and Moisture

The cultivation of mushrooms out-of-doors in Canada cannot be recommended. Occasionally such efforts may yield a number of specimens, but evidently this is more the exception than the rule. In some other countries climatic conditions are favourable enough to make this method quite a success.

Since mushrooms do not require light, their artificial culture, as far as the amateur is concerned, will be confined, for this and reasons of convenience, to cellars either below a dwelling or of the kind used for storing roots, and to other similar quarters. It may be mentioned that the fall of the year is considered the most suitable time.

The fundamental requirements are the facilities with which the proper temperature and degree of moisture may be maintained and controlled in any such chosen place. For this reason preference should be given to quarters where the least difficulties in this regard are likely to arise. Above all, the first condition for success is the keeping of temperature and moisture at a uniform level. Nothing seems more disturbing than sudden drops in temperature or the absence of a system of ventilation preventing the regulation of moisture in air and bed.

Granted these essentials, it can be understood that any premises, either specially built or already available, will suit the purpose.

Manure, the Medium for Artificial Culture

Notwithstanding the fact that in nature mushrooms grow on all kinds of soil, for the preparation of beds for artificial culture, horse manure is the only suitable medium. This manure must be carefully prepared for the purpose. Wood shavings or sawdust as used in some stables are better avoided by the amateur. The type of manure required should be selected with care if success

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is to come from the venture. Manure piled for a long time out-of-doors and exposed to rain is impoverished; manure containing too much straw or the "droppings" alone is unsuitable. Fresh manure, preferably from horses fed on grain and mixed feeds and with wheat or rye straw as bedding, has given the best results after preparation.

Curing of Manure

For this purpose clear the stalls daily and pile the manure under cover on the floor, to a height of four to five feet. Avoid mixing long and dry straw with the manure, which should be moderately moist. The pile should be left to ferment undisturbed for about ten days; then it should be turned over at intervals of from five to ten days, taking care to shake out and remove at each operation any long straw. During the process of turning, pay attention to the moisture-content; the manure should never dry out and never be too moist. It should not form lumps or balls that retain their shape under pressure. If too dry, moisten with a little water; if too wet, turn over several times in succession to reduce moisture. During the curing operation manure must not be exposed to freezing. Frost stops the necessary fermentation. Summer's heat equally interferes with the process of proper curing.

It will be seen that considerable manipulation of the manure is required; the proper condition is usually obtained after some experience.

Dry manure will spoil by burning during fermentation—as shown by the turning ashy-grey of the burned portions. Spontaneous combustion is very unlikely to occur.

Wet manure will become inactive as regards fermentation, but the process is bound to set in any time the right degree of moisture is re-established. Since this may be after the manure is moved to the beds and planted, one can imagine results. There will be no mushrooms, even though the best of spawn has been planted.

Provided all untoward conditions have been successfully avoided, the manure will have lost most of its strong odour; it will no longer steam vigorously, and its texture will be uniform as well as its colour, which should be chocolate-brown. It will be of a flaky nature, easily passing through the fingers, and yet not by any means dry. Above all, the temperature of the pile has become moderate as well as uniform. Once this mechanical condition and colour has been attained, and once the temperature of the pile is evenly some 100 to 130° F., the process of curing has been completed.

For safety's sake the pile may be left for two more days, during which the temperature should not materially rise or fall. Thereafter it may be transferred to the beds.

The Mushroom-beds

These may be situated either on the cellar floor or be arranged in a series of shelf-like tiers one above the other along the sides of the walls. A single bed may be some three feet wide, more or less. The width is immaterial and simply a matter of convenience; equally so is the distance of one tier above the other.

It is not necessary, but more convenient, to enclose the beds in a wooden framework of inch boards about ten inches high. On concrete floors it is preferable to provide a wooden bottom to the beds. Any rough boards will suffice. Earth bottoms have the advantage over cement or bricked floorings of retaining and regulating moisture more readily. The cured manure may now be transferred to the framework of the beds. It should be spread in a layer about three inches thick, avoiding lumps, over the bottom. Then it should be gently pounded to form a compact layer. Keep on adding other layers, pounding them down until the bed is about ten inches deep. Unless well compacted, the beds will quickly dry out, and artificial watering is not easy. The manure should

always be kept uniformly moist in the beds. When squeezing it firmly with the hand, water should never drop away, yet the feeling should be one of moisture. If too dry, sprinkle the surface of the bed with lukewarm water; small amounts at repeated intervals are better than one copious soaking. After this stage has been reached, the manure should properly warm up slightly and evenly to 130-140° F. If no increase in temperature takes place, there is the possibility that failure will result. At some stage or other there must have occurred an error, which is now difficult to correct. The manure may be too wet, and compacted in consequence too firmly; or it may have been too dry. When no warmth develops, the cause had better be ascertained and the bed loosened with a fork, left for twenty-four hours if too wet, or moistened if too dry, and then pressed down again. This will often restore activity.

Provided the temperature of the beds has declined to about 70-°75 F., "spawning" or planting may be proceeded with.

"Spawn" and Spawning the Beds

About this time the surface of the bed may show the growth of moulds and common manure fungi. These constitute no obstacle and will quickly pass away.

Spawn is nowadays almost exclusively produced by pure culture methods and can be obtained from dealers in standard bottles or cartons. This type of spawn is superior to the old brick spawn in that it assures a superior stock and avoids the possibility of introducing harmful insects or diseases with the spawn. This pure culture spawn is usually received in an actively growing condition and should be used without delay, since at this stage air is a prime requisite and the cultures are likely to spoil unless used at once. In planting, the contents of a standard quart bottle of spawn are removed and broken up into fifty pieces, which are planted ten inches apart each way and one inch deep. Each bottle will, therefore, plant about thirty-five square feet.

When the spawn has been distributed, level the surface of the bed, press down once more and let it rest undisturbed for a week or ten days. Any kind of growth showing before this lapse of time is likely not due to the spawn. About this time, if everything goes well, one may observe the mycelium growing from the spawn. It consists of rather strong, creamy-white strands, and must not be confused with the delicate and fuzzy growth of moulds so often appearing from dead spawn portions. When seen once, there is no mistaking the proper spawn development. About two to three weeks after planting one should gently cover the beds with a layer about one inch in thickness of rich, medium-moist garden soil preferably of a loamy nature and free from rocks and lumps. Do not press down this soil casing or dressing.

Temperature and Moisture Control

In from six to eight weeks, mushrooms will appear if directions have been followed. All the time the greatest concern should have been proper moisture conditions of the beds Too much ventilation will dry out the beds; the reverse will make them cold and wet. To both conditions, mushrooms remain strongly impassive.

Sometimes the surface alone is dry and the bottom wet, a common occurrence when the bed is on a concrete floor, so a very gentle sprinkle will suffice to establish the proper equilibrium. Before giving water, always make sure the bed requires it. Keep the floors moist, especially if the beds are on earth bottom. This will often suffice with a very occasional surface sprinkling. If the whole bed is too dry, apply lukewarm water in small quantities at about six-hour intervals until the bed appears just properly medium-moist. Once mushrooms appear, water may be more freely given, but always in small quantities only.

What has been said about the proper temperature and moisture conditions of the beds is equally applicable as well as equally important to the surrounding air. It is obvious that rapid changes in the temperature of the air will affect the moisture content of the beds. If it be too low, the beds will become wet and cold; if too high, the opposite will result. This is one of the most essential and fundamental conditions for success.

Uniform air temperature above all things is now important. The maintenance of this is largely a matter of ventilation. Even air temperature in the mushroom cellar really means even moisture content. The most useful temperature is that remaining within 50-60° F.

If ten weeks after spawning no mushrooms appear, the venture has usually been a failure, and a careful analysis of the previous procedure is necessary, with a view towards improving methods the next time.

A bed in full bearing will keep on yielding good returns for some two to four months, but be prepared for a shorter time. When exhausted, remove the manure, which should not be used a second time. It will come in very useful in the garden. Whatever quarters have been used should be thoroughly cleaned out, and the framework of the beds sprayed with formaldehyde or similarly effective but temporary disinfectants.

In a circular of this kind it is not possible to include all of the details relative to the culture of mushrooms, and the prospective grower is advised to consult one of the many manuals on this subject. A list of these can be obtained by writing to the Division of Botany and Plant Pathology, Central Experimental Farm, Ottawa.

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